5 Technology Validation and Market Introduction

Consumers lack reliable information about underutilized technologies already on the market. Many barriers thwart the adoption of advanced technology (Energy Star is not in the research results business), including a hesitancy to accept unproven new technologies, lowest first-cost procurement policies, tax disincentives, and a lack of credibility about professed benefits. To overcome these barriers, BT's Technology Validation and Market Introduction activities, including Appliances and Emerging Technologies and Energy Star, work with partners to speed the adoption of energy efficiency and renewable technologies in the marketplace.

Partners are central to bridging the gap between research and widespread utilization. Some of the major stakeholders in this endeavor are State governments, local entities, utilities, retailers, and manufacturers. They have established infrastructures, networks, and delivery mechanisms to reach the ultimate consumers, and their relationships with consumers give them credibility. BT exchanges information with its stakeholders to ensure the feedback critical to the development of successful next-generation research and regulation.

5.1 Appliances and Emerging Technologies

Appliances and Emerging Technologies (AET) is a crosscutting function in the Building Technologies Program that represents a two-way path to the marketplace, providing both access to the market and market intelligence from critical technology buying sectors to BT's technology development managers. Accordingly, its role within BT is to better integrate the whole of BT's activities into the marketplace.

5.1.1 External Assessment and Appliances and Emerging Technologies Market Overview

By regularly engaging potential buyers of BT technologies into BT projects, by offering near-term and medium-term opportunities to those buyers to benefit from energy-saving technologies, and by bringing valuable market information back into BT (especially from technology buyers), AET improves BT's relevance and knowledge of the market. Simply stated, AET helps BT stay connected and be responsive to the market.

AET aims to transform the technological capabilities that the BT program and others create into reality in the marketplace, and in doing so, to support the application of enabling technologies so that new and existing buildings can make progress toward zero net energy consumption. Where R&D results in technologies and design strategies to meet the ZEB goal, AET promotes their application as they become available to achieve energy savings in the near-term through the introduction of advanced, energy efficient products and techniques. The program accomplishes this through product testing, near-term research, late stage development, market aggregation, large-scale procurement and other market introduction methods in close cooperation with market actors. In promoting market-driven innovation in this way, AET not only enhances the effectiveness of R&D programs, but also widens the pipeline through which technologies become available for promotion through programs like Energy Star and ultimately for incorporation in regulatory standards.

5.1.2 Internal Assessment and Appliances and Emerging Technologies History

The DOE AET program traces its origins to Sections 127 and 128 of the Energy Policy Act of 1992 (PL 102-486), which required a report to Congress on a variety of measures to promote efficient appliance development and early replacement in cooperation with utilities and manufacturers. The report, *Partnerships for Technology Introduction – Putting the Technologies of Tomorrow into the Marketplace Today*, contained a variety of recommendations developed by a broadly-constituted group of experts and stakeholders, and it resulted in the launch of what is now called the AET program as part of the Climate Change Action Plan.

In the decade since then, AET has completed a number of projects that have resulted in either successful market introduction of new technologies and products or have provided important support to the early market adoption of recently commercialized products, and it also conducted product labeling activity that later became DOE's portion of Energy Star. Over the life of the program, utility deregulation has changed the framework for what was once utility demand-side management and integrated resource planning, and AET now counts as partners many state and regional market transformation organizations that have taken on this public role in promoting efficiency.

5.1.3 Appliances and Emerging Technologies Approach

AET is unique within the BT Program in that it:

- Induces technology development by equipment and system manufacturers in response to market demand identified by the project and promotes innovative application of technology by energy consumers;
- Places a strong emphasis on the technology buyers' perspective and needs;
- Encompasses a wide range of building energy efficiency technologies, not narrow categories, such as windows or lighting; and
- Operates short-term projects, within an investor's time horizon, typically four years or less.

By focusing on short-term to medium-term technology application projects, addressing near-term technical and market barriers, and building market anticipation of new products, AET fills a unique role within BT. Although AET does not focus on BT technologies exclusively, it does offer a mechanism for accelerating introduction of appropriate BT technologies to the market. In this capacity, AET complements the BT Energy Star and Equipment and Appliance Standards subprograms by helping to achieve sufficient market acceptance for new technologies to justify progressively higher Energy Star efficiency levels and ultimately regulatory standards. This capability will be especially important as technologies contributing to net-zero energy buildings mature early, providing opportunities for interim energy saving applications before the entire array of ZEB capabilities is ready.

AET uses a variety of approaches to accelerate introduction and early market acceptance of technologies. Primary among them are:

- Competitive technology procurements
- Late-stage technology refinement in conjunction with influential product users
- Field performance evaluation and verification for the benefit of large-scale buyers
- Product performance testing
- Product design competitions in cooperation with major market actors
- Voluntary product guidelines and conventions

Not every approach is appropriate for each technology or each market sector being targeted. Only after careful consideration and consultation with important market stakeholders does AET select an approach for a project. Sometimes selection of the best project approach is obvious, such as in the case of pursuing voluntary product guidelines

and conventions for addressing the residential lighting market problem of having so many possible combinations of lamps and ballasts. Consumers are left wondering whether they'll ever be able to find replacement parts and producers are left wondering which lamp/base combination is likely to be most accepted by consumers. Voluntary product guidelines and conventions is an obvious fix to such a problem. But other times, selection of an approach can't depend upon rules of thumb. It can only be done after careful consideration of all market and technical factors.

AET places strong emphasis on collaborating with energy utilities, market transformation organizations, trade associations, state-funded R&D organizations, buyer organizations, manufacturers, large volume buyers and others in all of its projects. This is done to leverage resources, but more importantly, to increase the likelihood of overcoming what are often substantial market barriers.

The technology scope of the subprogram is all building technologies that arise from within or outside the BT research portfolio that can potentially contribute to realizing the goal of net-zero energy buildings and significantly reduce energy consumption in the buildings sector. They are either, not yet successfully introduced, but could be successfully introduced within three years with DOE assistance; or are successfully introduced, yet still in need of further refinement, performance verification, and support in order to bring down unit costs by expanding markets and production volumes.

The AET subprogram distinguishes itself by placing emphasis on understanding the needs and motivations of technology buyers, more so than is common in traditional R&D projects, which are typically based on close working relationships with technology developers and manufacturers. In the past, AET has engaged several buyer networks: government agencies, including branches of the military, housing authorities, HUD, and state agencies; electric and gas utilities; market transformation organizations, including CEE, NEEA, MEEA, NEEP, NYSERDA, and the CEC; the hotel/motel industry; national retailers, such as Home Depot, WalMart, Costco, and Lowes.

The program intends to deepen and broaden its networks of buyers and buyer influencers. In some cases, investments in cultivating these relationships will be made independent of particular projects, for the purpose of seeking direct buyer involvement in identification of project opportunities. Finally, AET cooperates closely with EERE technology deployment programs, including FEMP, Building America, Rebuild America, the low-income Weatherization Program, and Energy Star.

Process for Selecting Projects

In planning and selecting projects, AET works closely with other BT programs to identify and fill gaps pursuing ZEB goals and to coordinate its activities with R&D and system integration counterparts within BT, as with deployment programs housed in FEMP and OWIP. The subprogram will use a combination of processes for selecting future projects, including:

- ***Annual screening studies that review and characterize emerging technologies.*** The studies will not only identify technology development issues, it will also estimate potential energy savings, market readiness, and "fit" for DOE AET approaches. A draft of the first such screening study was presented to BTS staff in August 2001, and a second one was prepared for FEMP in 2004.[1]
- ***Annual solicitations of candidate technologies to be considered for inclusion in the program.*** These solicitations may be done independently by the AET program, or in cooperation with the existing NETL open solicitation process.
- ***Special purpose studies intended to develop in depth information in key market or technology areas of interest to the program.*** These studies will provide better understanding of project opportunities.
- ***BT ZEB critical path technology lists as they are developed by the R&D programs.***

In performing the screening studies, AET:

- Surveys available literature to identify energy efficient building technologies that fit within the scope and purpose of this program element;
- Analyzes those technologies for characteristics including performance, costs, technical barriers, market barriers, competing technologies, likelihood of becoming a new Energy Star product category or performance level, and other characteristics to determine their suitability for a DOE investment;
- Using the above analysis, identifies a short list of technologies that are good candidates for future projects; and
- Prioritizes that short list with criteria designed to rank highly those projects that simultaneously offer high energy savings, significant leveraging of partner resources, high buyer interest, and high likelihood of project success.

All projects selected will meet the following criteria:

- The project appears to produce significant energy savings within fifteen years (at least 0.5 primary TBtu per year).
- The projects are consistent with BT roadmaps and strategic plans and goals.
- The project promises to attract substantial financial and in-kind support from project partners.
- The projects are consistent with the subprogram's scope and goals.

After the short list of high priority technologies is identified, AET launches intensive efforts to validate our technology selections by working within the market to develop projects. In some instances, these efforts will reveal barriers to technology adoption that were unknown during project selection and prioritization. The newly available information will be cross checked with the assumptions used to highly rate the technology during project selection and prioritization to make certain a DOE investment is still justified. If it is not, the project will be terminated.

[1] HE Dillon, *et al.*, *Energy Efficiency and Renewable Energy Technology for the Federal Sector – A Preliminary Screening Study,* PNNL-14761, August 2004.

For all multi-year projects, annual assessments will be performed for the purpose of determining whether the project is on track for achieving success, or whether it should be terminated ahead of schedule. In some cases, these evaluations will be done internally for the purpose of continuous improvements in project implementation, and in others outside peers not involved in project development or implementation will provide objective evaluations of program performance.

5.1.4 Appliances and Emerging Technologies Strategic Goals

The objective of AET is to successfully launch, into the marketplace, an average of one new energy efficient product category per year. Since the program's inception, it has launched eight such product categories.[2] This objective is quantifiable, and easily measurable. The baseline against which this objective can be measured is the state of the target market at the beginning of technology project.

For example, in the case of the energy efficient apartment-size refrigerator project completed by AET, there was no apartment-size refrigerators offered for sale in the U.S. that exceeded the minimum DOE energy standards by more than a few percent. With its partners, AET helped successfully launch a new-to-the market, apartment-size refrigerator that exceeded DOE minimum energy standards by 30 percent, and helped secure sales of this refrigerator in excess of 100,000 units before declaring success and terminating the project. The planned new product category launches are similarly quantifiable.

5.1.5 Appliances and Emerging Technologies Performance Goals

A goal of AET is to introduce and successfully establish the early market acceptance of one important energy efficient building technology product category per year, on average. As shown in Table 5-1 below, AET seeks to introduce 12 new technologies or products by 2010 and thereby to achieve national energy savings of at least 10 TBtu per year by that year. Achieving these goals depends upon adequate funding, but the effect will be to improve DOE's success rate in speeding commercial introduction of energy efficient technologies and to increase the impact that it has on energy consumption.

Table 5-1 Appliances and Emerging Technologies Performance Goals

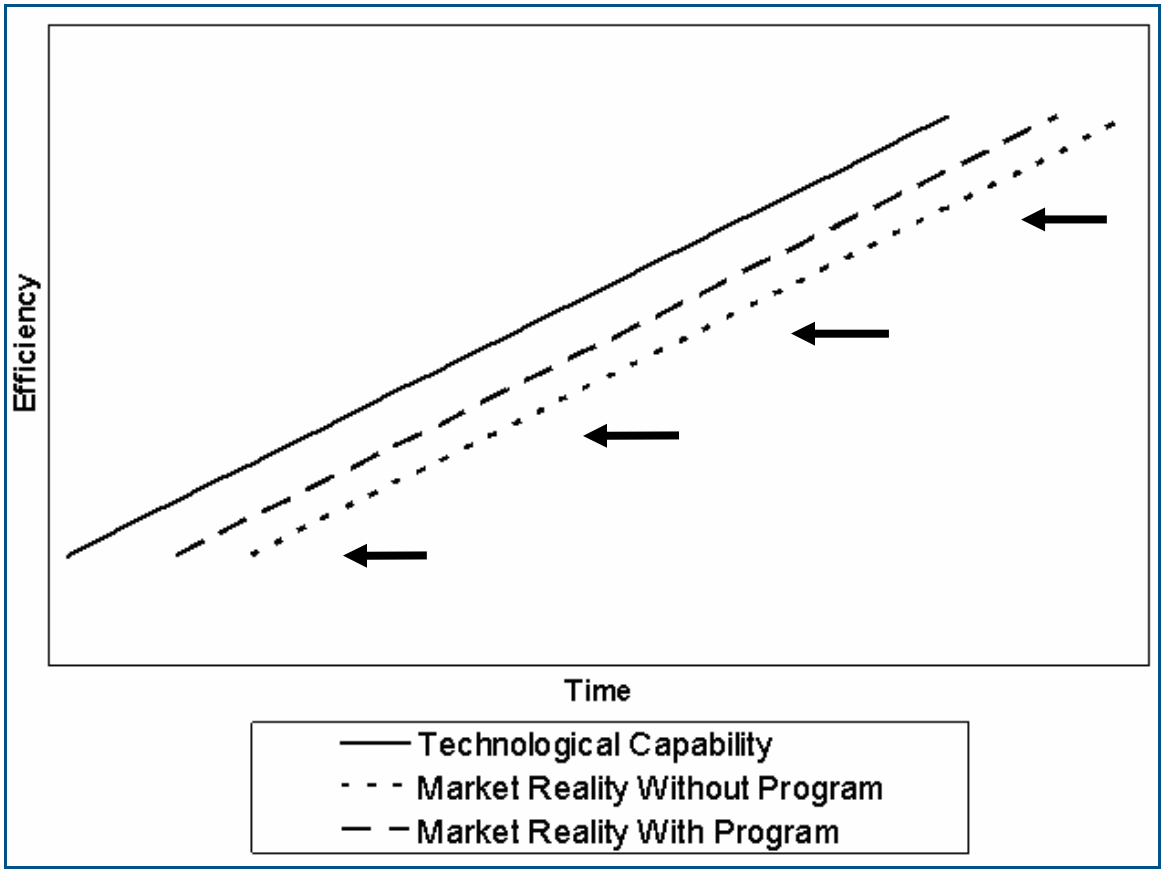
Characteristics	Units	Fiscal Year		
		2005	2008	2010
Cost sharing by partners	Dollars/year	$4M	$5M	$6M
Manufacturers participating	Number/year	16	20	20
Value of purchased technologies	Dollars/year	$25M	$30M	$30M
Cumulative new product categories introduced	Number	8	10	12

[2] The eight successful new product categories launched by AET include apartment-size high efficiency refrigerators, high efficiency horizontal-axis clothes washers, integral unit residential heat pump water heaters, insulated-ceiling-air-tight CFL recessed downlights, heat-tolerant reflector CFLs, sub-CFLs, commercial unitary air conditioners whose EER exceeds 13, decorative show-room-quality Energy Star residential fixtures, and standardized CFL table lamp bases.

As seen in the above table, cost sharing in AET projects presently amounts to approximately $4 million per year, including both direct and indirect cost sharing. AET plans for steady growth in cost sharing, reaching $6 million per year by 2010. There are 16 manufacturers that participate in AET projects in 2005. AET plans for steady growth in participating manufacturers, reaching 20 manufacturers by 2010. The value of products brought to market as a result of AET efforts amounts to approximately $25 million in 2005. AET anticipates it will grow this volume to about $30 million in 2010. The last row details the projected growth in AET's primary measurable objective. AET expects that the number of cumulative new product categories introduced will grow from 8 in 2005 to 12 by 2010. This growth rate averages approximately one new product category per year, which approximates AET's rate of success over the last 10 years.

In broad terms, the success of AET is measured by the degree to which the gap is reduced between market reality and technological potential created by R&D (See Figure 5-1). Since this element is a small component of the BT program and consists of discreet projects, progress can best be evaluated in terms of the extent to which individual projects attract participation and commitment by key market players and meet their specific goals.

Figure 5-1 AET Intended Impact[3]



[3] Pacific Northwest National Laboratory

5.1.6 Appliances and Emerging Technologies Market Challenges and Barriers

AET activities are designed to address a number of market barriers and other challenges that may impede the introduction of new energy efficient product categories. Without addressing these barriers, potentially successful new technologies may languish in R&D, or not reach their potential. AET tasks and the primary barriers they are designed to address appear in Table 5-2 below.

Table 5-2 Appliances and Emerging Technologies Market Challenges and Barriers

Barrier	Title	Description
A	Imperfect Information	Part of the risk a manufacturer faces in developing and introducing a new product, for example, arises from the difficulty in predicting the sales that will ensue, and if the unit cost is sensitive to production volume, large numbers of sales are necessary both to justify the manufacturer's investment and to make the product affordable to consumers. At the same time, consumers may be unaware of new technology and unsure of its applicability to their circumstances.[4]
B	New Enterprises	Imperfect information plays another role in impeding the adoption of technological advances that arise from small and new enterprises without widespread consumer recognition or ready access to markets.
C	Small Market Actors	A second market imperfection involves underinvestment in innovation by small market actors on account of their individual inability to conduct R&D projects on an adequate scale to succeed, and the likelihood that a major portion of the resulting benefits will accrue to others.
D	R&D Isolated from Markets	Finally, public R&D programs run the risk of pursuing technology for which no market exists.

5.1.7 Appliances and Emerging Technologies Strategies for Overcoming Barriers/Challenges

AET strategies designed to address the primary barriers above are described in Table 5-3 below.

[4] *Reliable, Affordable, and Environmentally Sound Energy for America's Future*, National Energy Policy Development Group. Washington, DC: Office of the President, May 2001.

Table 5-3 Appliances and Emerging Technologies Strategies for Overcoming Barriers/Challenges

Barrier	Title	Strategy
A	Imperfect Information	AET conducts programs designed to overcome imperfect and incomplete information as a source of risk and an impediment to applying new technology for increased efficiency.
B	New Enterprises	The AET program helps to counter these challenges by identifying promising advanced products, testing their performance, and making them more accessible to buyers.[5]
C	Small Market Actors	By aggregating markets, the AET program helps to overcome this barrier for small-scale energy users, who can influence technology and markets only in concert.[6]
D	R&D Isolated from Markets	With this in mind, AET disseminates information about the promise of new technology and the opportunities it represents, and it promotes innovation specifically by identifying markets and aggregating interested buyers as an inducement for manufacturers to offer cost-effective new products with lower energy consumption. And by maintaining close contact with market actors, the program provides useful perspective for the planning and execution of BT R&D programs.[7]

5.1.8 Appliances and Emerging Technologies Tasks

The tasks AET has planned to carry out the strategies over the next five years are listed in Table 5-4 below.

Table 5-4 Appliances and Emerging Technologies Tasks

Task	Title	Duration	Barriers
1	R-CFLs Phase 2 Technology Procurement	10 quarters	A. Imperfect Information
2	Recessed Downlight Technology Procurement	4 quarters	A. Imperfect Information, B. New Enterprises, C. Small Market Actors
3	Lighting for Tomorrow Competition	24 quarters	A. Imperfect Information; B. New Enterprises, C. Small Market Actors
4	CFL Base Standardization	12 quarters	A. Imperfect Information, C.

[5] *Reliable, Affordable, and Environmentally Sound Energy for America's Future,* National Energy Policy Development Group. Washington, DC: Office of the President, May 2001.

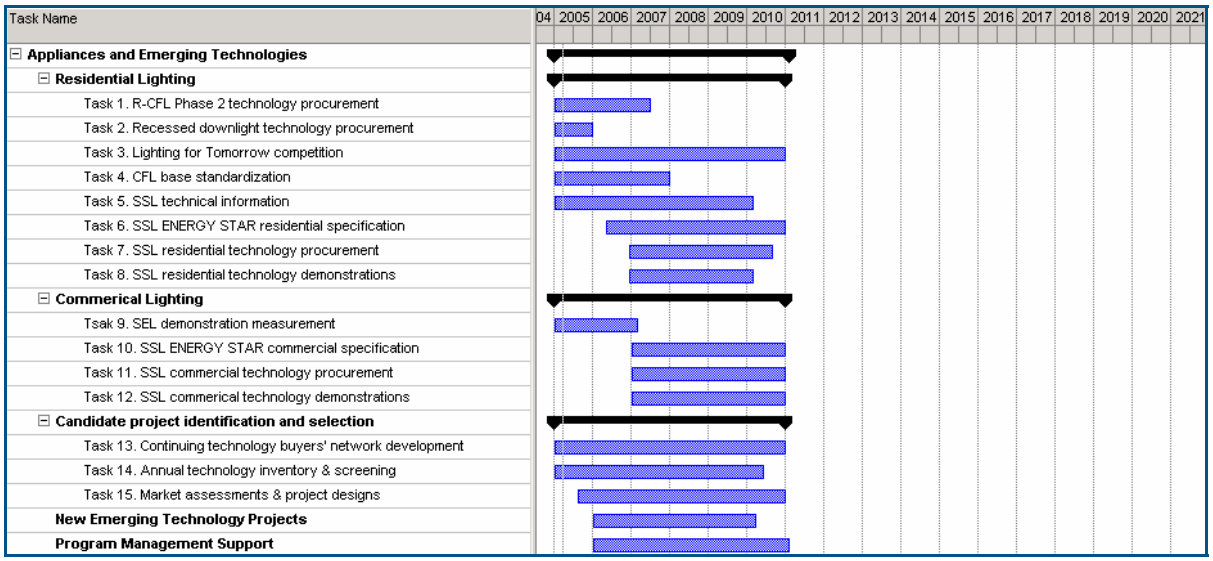
[6] Auerswald, Philip, and Branscomb, Lewis, 2003. "Valleys of Death and Darwinian Seas: Financing the Invention to Innovation Transition in the United States," *Journal of Technology Transfer,* 28, 227-239, Kluwer Academic Publishers, Netherlands.

[7] Auerswald, Philip, and Branscomb, Lewis, 2003. "Valleys of Death and Darwinian Seas: Financing the Invention to Innovation Transition in the United States," Journal of Technology Transfer, 28, 227-239, Kluwer Academic Publishers, Netherlands.

Task	Title	Duration	Barriers
			Small Market Actors
5	SSL Technical Information	21 quarters	A. Imperfect Information; B. New Enterprises
6	SSL Energy Star Residential Specification	18 quarters	A. Imperfect Information; B. New Enterprises
7	SSL Residential Technology Procurement	15 quarters	A. Imperfect Information; B. New Enterprises, C. Small Market Actors
8	SSL Residential Technology Demonstrations	12 quarters	A. Imperfect Information; B. New Enterprises, C. Small Market Actors
9	Spectrally-Enhanced Lighting Demonstration Measurement	8 quarters	A. Imperfect Information; B. New Enterprises
10	SSL Energy Star Commercial Specification	16 quarters	A. Imperfect Information; B. New Enterprises
11	SSL Commercial Technology Procurement	16 quarters	A. Imperfect Information; B. New Enterprises
12	SSL Commercial Technology Demonstrations	16 quarters	A. Imperfect Information; B. New Enterprises
13	Continuing Technology Buyers' Network Development	24 quarters	D. R&D Isolated from Market
14	Annual Technology Inventory & Screening	22 quarters	A. Imperfect Information
15	Market Assessments & Project Designs	22 quarters	B. New Enterprises

5.1.9 Appliances and Emerging Technologies Milestones & Decision Points

Figure 5-2 Appliances and Emerging Technologies Gantt Chart



5.2 Energy Star

Energy Star uses government/industry partnerships to promote adoption of energy efficient building products and appliances through voluntary labeling. By improving energy efficiency in buildings, Energy Star serves several important policy objectives, including two main objectives: saving energy and saving money.

5.2.1 External Assessment and Energy Star Market Overview

DOE's Energy Star activities include developing technical requirements and qualifications by defining Energy Star criteria for its designated products; monitoring standards for future Energy Star product categories; raising the bar on Energy Star labels when market penetration goals are reached and technology advances allow, especially following the establishment of higher minimum standards; promoting the manufacturing and purchasing of Energy Star products and co-sponsoring appropriate awards.

Secretary Bodman greeting the 2006 Energy Star Windows Partner of the Year.

5.2.2 Internal Assessment and Energy Star History

DOE participates in Energy Star through collaboration with the U.S. Environmental Protection Agency (EPA) that has been in effect since 1996. EPA and DOE each have responsibility for establishing the criteria for compliance with Energy Star levels and promotions for certain product categories. DOE has lead responsibility for light bulbs (compact fluorescent light bulbs), windows, clothes washers, refrigerators, refrigerator-freezers, freezers, compact refrigerators, dishwashers, and room air-conditioners. During its participation in the Energy Star Program, the Department has taken actions to increase the impact of the program by raising the efficiency criteria for the products for which is has responsibility and by increasing the scope of the program. Over the past several years, the Department has expanded the scope of its program efforts to consider "whole home" based strategies, including home audits, envelope sealing, HVAC testing and optimization, and other practices.

EERE recently consolidated all Energy Star management activities within the Building Technologies Program, and created a new position focused on DOE Energy Star activities, particularly on the coordination of interagency collaborations and partnerships. To produce a new strategic plan, a DOE team was formed comprising Headquarters and Regional Office staff and connected EERE personnel. The DOE team will evaluate both public and private Energy Star activity, and will identify opportunities to leverage cross-office and cross-agency efforts to gain the most benefit from the Energy Star brand.

The table below shows the market share of Energy Star labeled products between 1999 and 2003, demonstrating the increase in the efficiency of purchased appliances during the history of the subprogram.

Table 5-5 Market Penetration of Energy Star Qualified Products

Product	1999	2000	2001	2002	2003
Energy Star Qualified Clothes Washers	9%	9%	10%	16%	23%
Energy Star Qualified Dishwashers	12%	11%	20%	36%	57%
Energy Star Qualified Refrigerators	24%	27%	17%	20%	26%
Energy Star Qualified Room AC	13%	18%	12%	36%	29%

5.2.3 Energy Star Approach

A key part of the Energy Star process is revising the product criteria levels as the market share of qualified products increase, or as federal standards establish a new baseline by which products are measured. The frequency of the criteria revisions are a function of the product in question, how quickly manufacturers can change their production processes, the incremental savings and costs for each product, and the level of support for the products in the efficiency program sponsor community. This process of criteria setting, distribution network building and consumer education will continue to constitute the bulk of DOE's effort on the Energy Star program between now and 2010. However, the increases in federal efficiency standards and the fact that some technologies are beginning to reach the limits of their technical potential poses several programmatic challenges for Energy Star over the next five years:

- The energy and financial savings from some compliant products are becoming increasingly irrelevant to consumers. For example, Energy Star qualified refrigerators save the average consumer less than $10 per year.
- Retailers' and other distributors' profit margins from product sales are decreasing and many are emphasizing service delivery as a focus over the next several years.
- National and state energy policymakers and electric and gas utilities are increasingly focused on growth in peak demand. Many of the current Energy Star qualified products provide minimal peak savings.
- There also exists an energy savings potential in existing homes, coming from system, rather than product, optimization. For example, most of the efficiency gains from central air conditioning products come from proper installation and improvement of air handling systems, not from increasing equipment efficiency levels.

DOE will address these challenges adopting the following four strategies:

- Increasing the stringency of the criteria for compliance with Energy Star levels for existing products, where remaining cost-effective potential exists.
- Increasing the market share of Energy Star labeled products through increased collaboration with new partners, such as State energy offices.
- Accelerating the introduction of the next generation of efficient products developed through other BT and EERE programs.-
- Partner with other Federal agencies in developing an Energy Star-based whole house approach to efficiency, providing consumers a "pathway" to achieving a more affordable and comfortable home through proper equipment selection and systems improvements.

Each of these strategies is discussed in more detail below:

Strategy 1: Enhancing Existing Product Program Areas

As discussed previously, the process of criteria setting, distribution network building and consumer education will continue to constitute the bulk of DOE's effort on the Energy Star subprogram between now and 2010. During the past nine years, DOE has established technical compliance criteria for achieving the Energy Star label on the following products:

- Clothes Washers
- Dishwashers
- Refrigerators
- Room Air Conditioners
- Freezers
- Windows, Doors and Skylights
- CFLs

Labeling a product for Energy Star involves the following:

- **Step 1: Establish criteria**. Working with stakeholder groups, including manufacturers, retailers, energy efficiency program sponsors and interested non-governmental organizations, DOE provides technical analysis to ensure Energy Star criteria are established in a manner that highlights cost-effective products available to consumers through a variety of distribution channels. The program criteria are set in such a way as to not rely on a single manufacturer's proprietary technology and to ensure the establishment of Energy Star criteria does not compromise product functionality.
- **Step 2: Develop "distribution mechanisms" for qualified products.** A key part of Energy Star's success lies in its ability to work with a network of partners to highlight the benefits of efficient products. This includes manufacturers, national and local retailers, and local energy efficiency program sponsors, who provide financial incentives and consumer education materials. Energy Star works to ensure each key stakeholder's activities are coordinated to the highest degree possible.

- **Step 3: Conduct Consumer Education.** Energy Star provides technical and educational tools and outreach campaigns to help highlight the benefits of these products to consumers. These include cost calculators, brochures, product facts, media outreach, events, etc.

The program anticipates four main tactical elements of this strategy over the next five years to ensure the continued expansion and consumer acceptance. These are:

- ***Enhancing specifications and resolving technical issues***. BT will revise several of the product criteria will need to be revised in light of changes to Federal specifications or increased market share of the products.
- ***Improving Consumer Education***. BT will undertake actions that are product-specific actions to be taken to increase product awareness and consumer demand.
- ***Improving delivery of Energy Star-focused messages in the retail sector*:** While many retailers offer a wide variety of Energy Star products, maintaining a prominent and consistent presence for efficient products and ensuring that retail sales personnel are properly trained to explain the meaning of Energy Star and the importance of energy efficiency in general has been a challenge. BT will work directly with retailers to develop methods of increasing the visibility and relevance of Energy Star in the retail channel.
- ***Expanding Product Distribution Channels.*** Expanding the importance of Energy Star in the marketplace will require either increasing the number of suppliers promoting the product, or getting an increasing number and type of end-users to specify Energy Star in their purchases. BT will focus on both options.
- ***Improving data gathering and tracking***. Energy Star must be able to document its success to continue toward helping achieve BT's goals. In addition, the subprogram's ability to continue to leverage the support of private sector partners and energy efficiency program sponsors nationwide depends in large part on the ability to gather, summarize and communicate regionally-focused, timely market share data to program participants.

Strategy 2: Increasing the Impact of Energy Star

It has already been identified that the value of the Energy Star brand and its effectiveness as a deployment channel are not fully realized. Increased collaboration with State energy offices and more systematic communication among the regional offices on Energy Star not only can enable regions to share information and best practices, but also can leverage specialized skills in individual regions to benefit the entire network.

As a foundation for improving program integration within EERE, it will be valuable to directly align Energy Star subprogram performance metrics with EERE targets. In addition, more systematic communication among the Regional Offices on Energy Star not only can enable regions to share information and best practices, but also can leverage specialized skills in individual regions to benefit the entire network. The goal is to ensure cohesive delivery of Energy Star products, services, and education through comprehensive communications planning, as well as identify ways to improve working relationships between regional offices and contractors.

Externally, stronger partnerships with EPA will more fully leverage the power of Energy Star in deploying EERE building technologies; position DOE as a full partner in Energy Star planning and campaigns; enable EERE to better support Energy Star efforts in home and commercial building performance; and streamline Energy Star qualification of products for which DOE has already verified energy performance. Additionally, more formal cooperation with HUD is another promising opportunity. The goal is to raise the visibility of DOE in the Energy Star program, and improve partnerships in ways that mutually benefit DOE, EPA, and HUD strategic objectives and missions.

The four essential elements to this activity include (none of which is quantified or auditable):

- ***Improve marketing and outreach***. To accomplish this goal, Energy Star will:
    - Increase the level of participation by X% by the year Y in planning national campaigns promoting DOE products and services;
    - Develop mechanisms for manufacturers and retailers to gain access to local and regional efficiency programs;
    - Increase the relevance of Energy Star-based marketing campaigns and the efficacy of Energy Star-based sales personnel training in the retail sector; and
    - Complete a comprehensive communications plan for the subprogram, defining ways to better leverage the wide range of Energy Star partners and potential partners.

- ***Build a stronger network via the States and Regional Offices.*** To accomplish this goal, Energy Star will:
    - Create an action plan to strengthen coordination with national, state and local energy organizations, such as NASEO/STAC/ASSERTI, enhancing delivery and creating new channels for Energy Star products and activities;
    - Develop a password-protected portal containing current activities of each regional office's Energy Star program, a calendar of related events, descriptions of best practices, project descriptions and final reports from past AOP projects, grants, case studies (initially pilot as an add-on to an existing RO site); and
    - As part of the action plan, clarify deployment roles and responsibilities, and jointly planed outreach targets and activities. The plan will ensure advance communication and coordination with appropriate RO coordinators on activities in States and regions, as well as establishing and maintaining a communications protocol between ROs and DOE.

- ***Improve communication and program integration within EERE.*** To accomplish this goal, Energy Star will:

- Complete comprehensive communications planning for the subprogram, defining ways to better leverage the wide range of Energy Star partners and potential partners; and
- Improve integration of Energy Star with related EERE activities (e.g., include Energy Star integration as a reviewable metric in EERE program solicitations).
- Maintain an Energy Star Communications lead within the DOE Office of Communications.

- ***Strengthen partnerships among DOE, EPA, and HUD***. To accomplish this goal, Energy Star will:
  - Work with EPA to enable earlier and easier acceptance of technologies supported or qualified by DOE into Energy Star;
  - Recommend updates to the EPA/DOE Memorandum of Understanding or otherwise renegotiate the basis of the partnership; and
  - Complete and adopt a joint work plan by DOE, HUD, and EPA by year Y for formal cooperation on accelerating energy efficiency gains in the existing homes sector; and, by 2007, promote mechanism for purchase of Energy Star products by HUD for housing projects.

Strategy 3: Accelerating the Introduction of Advanced Products into Program.

New technologies typically flow from a conceptual stage of development to full adoption in the commercial arena via a series of linked activities. These specific activities in the innovation process are idea generation and selection, R&D, pre-commercial demonstration and promotion, and adoption into commercial arena. Poor linkage between these activities results in decreased delivery of technologies and value to the commercial arena. One of the key determinants for successful product development and deployment includes "institutions for collaboration" that effectively link upstream R&D with commercial deployment.[8] Without strong linkages, new products will not be transferred effectively to the marketplace; the full value from the R&D investment will not be captured. In a colloquium of leading innovation practitioners, 50 major companies exchanged knowledge and best practices regarding innovation and they identified linking R&D activities to commercialization as one of the major historic barriers affecting innovation success.[9] Therefore, to capture the full potential of the value created by investments in upstream R&D, it is necessary to invest especially in the linkages between upstream R&D and the commercialization market.[10] Energy Star, through its commercial partners and networks, is ideally positioned to assist in the commercialization of new products.

[8] Porter, Michael and Scott Stern. *National Innovative Capacity, The Global Competitiveness Report 2001-2002*, 2001, New York: Oxford University Press.
[9] *Priority Issues in Technology and Innovation Management,* Arthur D. Little, 2002.
[10] *Emerging Technologies Whitepaper*, California Energy Commission, February 2005.

To assist, BT will examine ways of using the Energy Star network of manufacturers, retailers, and energy efficiency program sponsors to accelerate the commercialization of products so they may be incorporated into the Energy Star program and properly promoted and incentivized. This process would be used during the 2005-2010 timeframe to accelerate the introduction of products such as: solid state lighting, advanced windows, heat pump water heaters, and photovoltaic systems, into the marketplace via the recognized brand identity of the Energy Star program.

There are three essential elements to this process:

- ***Holding Stakeholder meetings to discuss the state of the technology.*** These meetings would pull together the traditional Energy Star network of partners with those from the R&D community to identify the market barriers that prevent the technology from full commercialization and representation under Energy Star. These barriers can include cost, lack of installation or maintenance infrastructure, geographic limitations on use, availability, durability, etc.
- ***Designing coordinated pilot programs to address issues.*** Once these barriers are identified and prioritized, the stakeholders would coordinate pilot activities designed to further investigate or resolve a particular barrier to the technology. This effort would be designed to draw upon the reach and resources of the Energy Star partners to help jumpstart these efforts. This effort will involve generating publicity around the pilots.
- ***Institutionalize support for product in state/local policy making.*** Upon successful completion of pilots and addressing of market barriers, the network of partners would move to provide additional on-going support for the product in the form of incentive and/or consumer education.

Strategy 4: Evolving the Energy Star Program toward a Whole Home Improvement.

If Energy Star is to contribute fully to BT's goals of achieving cost-effective ZEB by 2025, it is going to have to work closely with the BT's Research and Development Activities to assist in developing consumer-oriented "pathways" to whole-home improvements that include HVAC installation and system optimization, envelope sealing and insulation, and whole home energy management systems. This work will be undertaken in conjunction with *Home Performance with Energy Star*, as well as with the HUD's *Partnership for Advancing Technology in Housing (PATH)*.[11]

This collaborative group will identify and define the individual elements of a whole-house upgrade, develop technical specifications or procedures for each element, conduct testing in the field, as necessary, establish verification protocols, and then work to encourage market adoption of each recommended element. DOE's role in this process will be defined in consultation with its collaborators, but would likely include:

[11] *Joint Initiative to Improve the Energy Efficiency of Existing Homes*, *DRAFT Document*, December 8, 2004.

- Working with EPA and HUD to define both the elements and overall framework of a whole-home approach, drawing on DOE's technical resources as appropriate;
- Developing simple but accurate technical tools to help suppliers present whole-home upgrades in a manner that consumers can easily grasp, and that foster understanding of the financial and non-energy benefits of undertaking these upgrades;
- Leveraging DOE's existing energy-efficiency programs (i.e., Rebuild America and Building America) and network of partners to help refine, test, and deploy the model in local regions; and
- Working with key industry groups, NGOs, efficiency program sponsors and others to define and institutionalize the protocols for these installation and verification of processes on a national level.

Within each of these elements, critical activities will need to be executed:

- ***Developing the Technical Protocols for Whole Home Processes.*** In most cases, commonly accepted, practical guidance on the necessary elements to achieve whole home performance does not exist. This stage will bring stakeholder groups together to discuss technical specifications/procedures, verification processes, and roles.[12]
- ***Conducting Consumer Outreach.*** One of the biggest barriers to achieving whole home performance is consumers do not understand the benefits of systems improvements, do not know what to ask for, and do not understand what separates quality work from substandard work. Under this task, DOE would work with EPA and HUD to better investigate ways in which the benefits can be conveyed to consumers, and to work with stakeholders that develop outreach materials and technical tools to convey these messages and ensure contractors have the right sales tools necessary to sell these services to consumers.
- ***Institutionalize the Market Infrastructure for Whole Home Services.*** If successful, these services must be profitable and practical for delivery by contractors, remodelers, homebuilders and retailers increasingly interested in this business. In addition, the benefits must be rigorous enough for inclusion in public benefit charge programs at the state and local level. Under this task, DOE would undertake a series of activities to test the models to ensure they are sufficiently rigorous and practical to serve the needs of all the critical stakeholders.

5.2.4 Energy Star Strategic Goals

The overall objective of the Energy Star subprogram is to accelerate the commercialization and increase the market share of energy efficient products and services in residential and commercial marketplaces to help American consumers realize over 1.2 quads and $23 billion in energy savings by 2010.[13] Full commercialization of these technologies will be essential to helping BT realize its goal of achieving cost-effective net-zero energy buildings by 2025.

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[12] Hendron, Robert, *Existing Homes Target Market Assessment*, National Renewable Energy Laboratory, February 19, 2004.
[13] *Energy Star Program Analysis*, D&R International, January 2005.

5.2.5 Energy Star Performance Goals

The key specific performance goals are included in the following tables.

Table 5-6 Energy Star Performance Goals

Strategy	Targets		
	2007	2009	2010
Enhancing Existing Product	▪ New Criteria: Clothes Washer and Dishwasher		▪ New Criteria: Room Air Conditioner and Refrigerators
Accelerating the Introduction of Advanced Products		▪ Introduction of SSL into Energy Star	▪ Introduction of advanced products (Heat Pump Water Heaters, PV Dynamic Window systems) into Energy Star

5.2.6 Energy Star Challenges and Barriers

The biggest risk to the realization of Energy Star's goals is losing the ability to leverage the energies and resources of the network. As the past decade has demonstrated, huge market shifts have occurred when this network has coordinated their efforts on promoting specific technologies. However, as the needs of each of the partners change, so too will the Energy Star approach and types of technologies promoted. For example, many utilities and local energy planners are concentrating on controlling the growth of peak electric and gas demand, which most of the existing Energy Star labeled technologies do not address in any significant fashion. In addition, the retailers are increasingly focused on using services, not products, as their main profit drivers for the next few years. To ensure Energy Star continues to occupy its place in the market, the subprogram will have to evolve and ensure it addresses these critical market needs. Additional key barriers are discussed below in Table 5-7.

Table 5-7 Energy Star Market Challenges and Barriers

Barrier	Title	Description
A	Lack of Consumer Education	Another barrier is lack of consumer awareness of the benefits of efficient technologies and services. Often, consumers do not know what technologies and options exist, and/or do not fully understand the energy and non-energy benefits of the technologies or services, or are overwhelmed by the technical detail usually provided in explaining the technology or service.
B	Need to enhance existing or introduce new criteria	Many of the emerging efficiency technologies that can produce significant energy savings are expensive; costs will have to be reduced remaining efficiency technologies are expensive.
C	Leveraging the Network	The biggest risk to the realization of Energy Star's goals is losing the ability to leverage the energies and resources of the network because of minimal levels of energy and cost savings from existing products.

5.2.7 Energy Star Strategies for Overcoming Barriers/Challenges

The strategies that Energy Star has developed to overcome the barriers above are described in Table 5-8.

Table 5-8 Energy Star Strategies for Overcoming Barriers/Challenges

Barrier	Title	Strategy
A	Leveraging the Network	By developing a clear communication plan, actions will be identified to leverage and grow the existing network.
B	Cost	The Energy Star label can help to create demand, increasing the volume of products sold, which will lead to a reduction in the price to the consumer.
C	Lack of Consumer Knowledge	The Energy Star label serves as a reassuring message to the consumer, that this product will save energy and perform well.

5.2.8 Energy Star Tasks

Energy Star has identified the following tasks over the next five years to carry out the strategies for overcoming barriers.

Table 5-9 Energy Star Tasks

Task	Title	Duration
1	Criteria Changes/Technical Issues	20 quarters
2	Consumer Education	ongoing
3	Expanding Product Distribution Channels	ongoing
4	Data Gathering/Tracking	ongoing
5	Improve Marketing/Outreach	ongoing
6	Build Stronger Network via the State and Regional Offices	ongoing
7	Improve Communication and Program Integration within EERE	ongoing
8	Strengthen Partnerships among DOE, EPA, and HUD	ongoing
9	Stakeholder Meetings	16 quarters
10	Coordinated Pilots	12 quarters
11	Policy Institutionalization	8 quarters
12	Technical	ongoing
13	Consumer Outreach	ongoing
14	Market Infrastructure	ongoing

5.2.9 Energy Star Milestones & Decision Points

Figure 5-3 Energy Star Gantt Chart